Road Accidents and Prevention

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***Abstract*—Road accidents cannot be stopped despite providing the best possible roads and intersections, however there are ways to reduce the impact of road accidents on road-users and the vehicles plying on the road.The incidence of accidental deaths has shown an increasing trend during the period 2005 - 2015 with an increase of 54.3% in the year 2015 as compared to 2005 increase in the rate of accidental deaths during the same period was 25.5%.A total of 4,00,517 accidental deaths were reported in the country during 2015 (5,535 more than such deaths reported in 2014) showing an increase of 1.4% as compared to 2014. However, the average rate of Accidental Deaths has remained same 32.6 in 2014 and 2015.In the stretches we studied the road accidents are increasing rapidly .We studied accidental records of various police-stations ,identified the black-spots of accidents and then analyzed the geometric features of those spots whose observation is given in this paper .The identification of such points provides us ease to work on some section of road which is most prone to accidents .We analyzed the geometric deficiencies and they recommended ways to reduce their affects. The findings indicated that large radii right-turn curves were more dangerous than left curves, in particular, during lane changing maneuvers. However sharper curves are more dangerous in both left and right curves. Moreover, motorway carriageways with no or limited shoulders have the highest CR when compared to other carriageway width. Proper traffic guidance and control system to guide road users ensuring safe movement of vehicles has been recommended and some of the facilities such as pedestrian crossings and median openings, acceleration and deceleration lanes were re-designed in order to improve the safety of the road and minimize the accidents.**

***Index Terms*—Component, formatting, style, styling, insert.**

I. Introduction

The problem of accident is a very acute in highway transportation due to complex flow pattern of vehicular traffic, presence of mixed traffic along with pedestrians. Accidents are multifactor and random. Traffic accident leads to loss of life and property. Thus it is imperative that traffic engineers take the big responsibility of providing safe traffic movements to the road users and ensure their safety. The aim of zero causality is although difficult even considered impossible by some, but with the latest technologies and advancement in the field it is possible to reduce this in fractions per 100,000 population. This will require a significant investment.

By suitable traffic engineering and management the accident rate can be reduced with scare resources. For this reason systematic study of traffic accidents are required to be carried out. Proper investigation of the cause of accident will help to propose preventive measures in terms of design and control. . A primary source of highway safety data is crash data collected by police officers at the scene. Police are unique in their ability to collect on scene crash data shortly after the crash occurs, as well as the transient data that may erode (i.e., tyre marks) or be removed from the scene. Although police are in a unique position to collect crash data, data collection is not their only responsibility. Their primary on scene responsibilities includes securing the crash site, caring for injured persons, and re-establishing traffic flow. Therefore, on scene data collection systems must consider the officer's needs when implementing new technologies. Once a series of data collected, accident sites are selected for possible treatment and before a decision can be made which sites will be treated and the type of improvement work necessary, further information is usually needed. This extra data, obtained through site visits, should relate to both the site accident data and to the other factors that might help to determine what the problem at the site is. On site visit, data should include details of the road, its environment, vehicle features and road user characteristics, Signs and Marking, Lighting, Width, Poles, posts, etc. Divided/undivided ,Legibility, Height, Horizontal railings, Number of lanes, Conspicuity Intensity, Rocks, trees, other Cross fall Comprehensibly Obstruction hazards, Gradient Credibility, Parked Vehicles , Safety barriers, fences, Shoulder , Lane, center On street parking ,Side slopes, Verge And edge lines , Culverts Median and Other markings, Off-street parking and Bridge abutments, access openings Pavement markers , Visibility ,Footpath, Post mounted Clearway hours, Kerbs, pram ramps , delineators ,Parking controls On intersection approach, Drainage Hazard markers , Loading facilities Of side road Combination of Chevron alignment, Bus stops , Of traffic control devices , factors Markers Taxi rank Of pedestrians , Physical obstruction Of parked vehicles

II. Causes of Accidents

Accidents are rare, multifactor and random. It is not a chance but a chain of events involving:-

Road Users

Excessive speed and rash driving, violation of traffic rules, failure to perceive traffic situation or sign or signal in adequate time, carelessness, fatigue, alcohol, sleep etc.

Vehicle

Defects such as failure of brakes, steering system, tire burst, lighting system, etc.

Road Condition

Skidding road surface, pot holes, ruts,etc.

Road design

Defective geometric design like inadequate sight distance, inadequate width of shoulders, improper curve design, improper traffic control devices and improper lighting,.

Environmental factors

Unfavorable weather conditions like mist, snow, smoke and heavy rainfall which restrict normal visibility and makes driving unsafe.

Other causes

Improper location of advertisement boards, gate of level crossing not closed when required etc.

III. OBJECTIVES OF ACCIDENT STUDIES

1. To study the causes of accidents and suggest corrective measures at potential location
2. To evaluate existing design
3. To compute the financial losses incurred
4. To support the proposed design and provide economic justification to the improvement suggested by the traffic engineer
5. To carry out before and after studies and to demonstrate the improvement in the problem.

IV. LITERATURE REVIEW

There are some symbols that unite the world e.g. the red ribbon which brought such momentum to awareness of HIV/AIDS, white band against global poverty. Now these are joined by a new symbol. The Road Safety Tag is the global symbol of the movement to improve safety on the roads. It has been adopted as the official symbol for the United Nations' Decade of Action for Road Safety 2011-2020.

Fig 1 UN decade of action for road safety symbol

"In response to the global epidemic created by road traffic crashes, the United Nations General Assembly resolution 64/255 proclaimed the period 2011-2020 as the decade of Action for Road Safety "with a goal to stabilize and then reduce the forecast level of road traffic fatalities around the world by increasing activities conducted at the national, regional and global levels". The United Nations Decade of Action for Road Safety 2011-2020 was officially launched by the UN Secretary General, Ban Ki-moon on 11th May 2011 was these words "I call on Member States, international agencies, civil society organisations, business and community leaders to ensure that the Decade leads to real improvements".

"In 1990 Road traffic injuries were ranked at the 9th place in disability-adjusted life year (DALY) diseases which is a measure of overall disease burden. In 2010 it was estimated to jump to 3rd place by 2020 higher than HIV, TB, War, etc."

"It is believed by Road safety that, with the right action, up to 5 million lives could be saved and 50 million injuries prevented during this decade of action. Therefore achieving a reduction of about 50% with respect to the predicted global death toll by 2020."

V. ACCIDENT STATISTICS

The statistical analysis of accident is carried out periodically at critical locations or road stretches which will help to arrive at suitable measures to effectively decrease accident rates. It is the measure (or estimates) of the number and severity of accident. These statistics reports are to be maintained zone-wise. Accident prone stretches of different roads may be assessed by finding the accident density per length of the road. The places of accidents are marked on the map and the points of their clustering (BLACK SPOT) are determined. By statistical study of accident occurrence at a particular road or location or zone of study for a long period of time it is possible to predict with reasonable accuracy the probability of accident occurrence per day or relative safety of different classes of road user in that location. The interpretation of the statistical data is very important to provide insight to the problem.

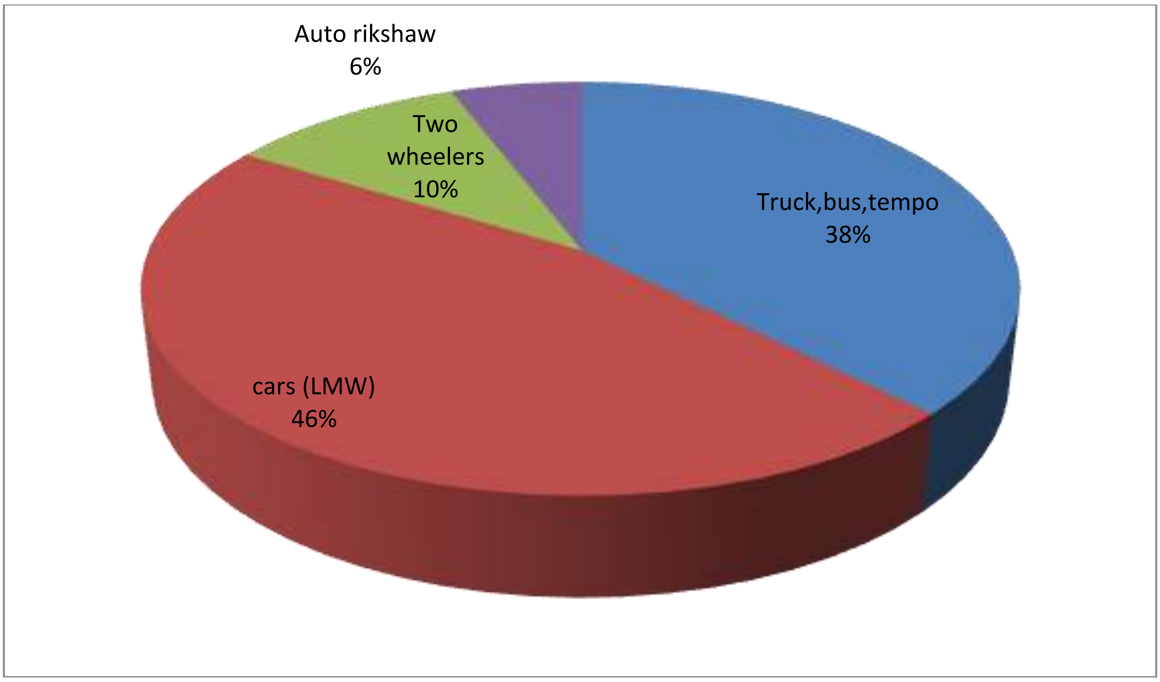

Figure 1 .Percent share in total road accident by type of motor vehicle involved (Primary responsible) in year 2013 (Obtained by analyzing accidental data from police stations)

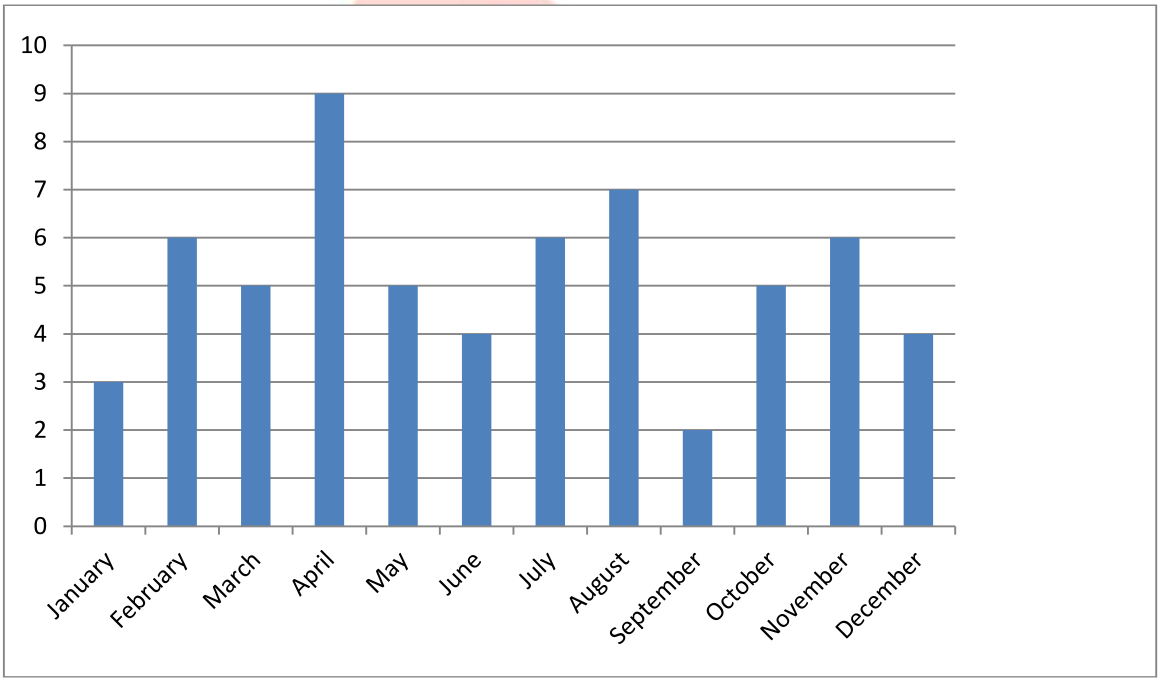

Figure 2. Monthly distribution of accidents in the perspective stretches analyzed.

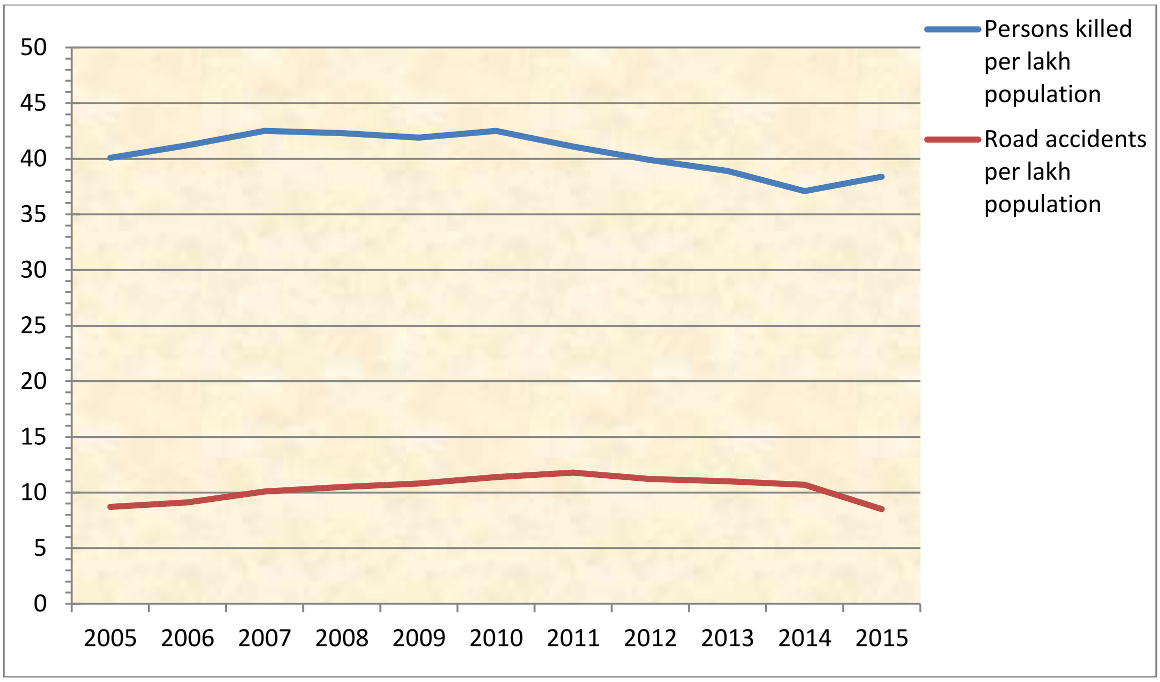

Figure 3. Accidents & Deaths per lakh population .

VI. Accident Evaluation and Black Spot Investigation

The accident data collection involves extensive investigation which involves the following procedure:

Reporting: It involves basic data collection in form of two methods:

Motorist accident report - It is filed by the involved motorist involved in all accidents fatal or injurious.

Police accident report - It is filed by the attendant police officer for all accidents at which an officer is present. This generally includes fatal accidents or mostly accidents involving serious injury required emergency or hospital treatment or which have incurred heavy property damage.

At Scene-Investigation: It involves obtaining information at scene such as measurement of skid marks, examination of damage of vehicles, photograph of final position of vehicles, examination of condition and functioning of traffic control devices and other road equipments.

Technical Preparation: This data collection step is needed for organization and interpretation of the study made. In this step measurement of grades, sight distance, preparing drawing of after accident situation, determination of critical and design speed for curves is done.

Professional Reconstruction: In this step effort is made to determine from whatever data is available how the accident occurs from the available data. This involves accident reconstruction which has been discussed under Section No.7 in details. It is professionally referred as determining “behavioral” or “mediate” causes of accident.

Cause Analysis: It is the effort made to determine why the accident occurred from the data available and the analysis of accident reconstruction studies.

VII. Black Spots

The treatment of specific types of accidents at a single location or on short lengths of roads, (e.g. 300 m - 500 m stretches of road) this involves treating a specific site or short length of road. Look for clustering by accident type, rather than identifying site on the basis of total accident numbers only. Particular accident types can be identified, for example, there may be cluster of right angle accidents or run off road accidents.

TABLE 1. Data collected from various accident prone stretch or Black-Spots

S.No	Place	Radius (m)	Super Elevation/Cross Slope (%)	Carriage Way Width (m)
1.	Shalteng Crossing	Straight	2.5	9
2.	T.K. College	150	6	9.4
3.	Lawaypora	Straight	2.5	9.3
4.	Jawbrara	Straight	2.7	6.7
5.	Pandav Park 1	125	7.3	7.3
6.	Mantaqi Ziyarat	131	4.2	6.9
7.	Pandav Park 2	78	6.6	7.45
8.	Police Station Awantipora	Straight	2.8	7.1

9.	Hyderpora Chowk	Straight	2.5	7
10.	Parraypora	Straight	2.3	6.25
11.	Baghat Chowk	Straight	2.3	6.8
12.	Bemina Chowk	Straight	2.5	8.25
13.	JVC	Straight	2.5	8.3
14.	T Chowk near Ansari Toyota	182		8.2

Table .2 .Indication of geometric deficiency and safety measures to reduce accidental rates

Geometric Deficiency	Safety Measures
1. Narrow lanes and shoulders	▪ Pavement edge marking ▪ Raised pavement markers ▪ Post delineators.
2. Steep sideslopes/ Roadside Obstacles	▪ Flatten sideslopes upto 3:1 or steeper where runoff accidents occur eg, at sharp curves ▪ Remove obstacles like trees, poles or relocate ribbon development. ▪ Pavement markings and signage.
3. Narrow Bridge	▪ Warning signs and markings ▪ Transistion guardrails at bridge approach. ▪ Rehabilitated or new bridge rails.
4. Sharp horizontal curves	▪ Widening carriageway and shoulders. ▪ Appropiate superelevation. ▪ Pavement anti-skid treatment. ▪ Obstacle removal and use of roadside barriers like guardrails. ▪ Reflective guide markings and raised pavement marking.
5. Poor sight distance	▪ Traffic control device and markings and signs. ▪ Fixed hazard obstacles removed. ▪ Shoulder widening.
6. Hazardous intersection	▪ Traffic control devices. ▪ Traffic control signalization. ▪ Speed controls. ▪ Channelization and use of roundabouts.
7. Edge drop shoulders	▪ Paving shoulders at critical points like sharp cures ▪ Tapering pavement edge shape.
8. Lack of skid resistance	▪ Providing high skid resistance during maintenance programme. ▪ Apply a specific “anti-skid” treatment at potential junctions and pedestrian crossings ▪ Re-texturing and surface dressing. ▪ Use of porous asphalt on wearing course.

VIII. SPECIFIC SITE ANALYSIS

Causes of accidents:

1. Lack of Spatial Guidance

2. High Approach Speeds persists
3. No sign and marking
4. Multiple maneuver
5. The problem of delay exists for minor road traffic which has to give way. If the delays are excessive, emerging drivers may take undue risks in order to enter or cross the main stream.
6. Edge obstruction like poles and trees very close to pavement edge
7. Edge drop shoulder
8. High pedestrian movement
9. Excessive ribbon development near the road side
10. Narrow Carriage Way
11. Inadequate Drainage Systems
12. Road Side encroachments
13. Presence of potholes
14. Presence of advertisement boards on curves leading to distraction of driver

Countermeasures

1. Local widening in the centre of the junction, allow protected waiting areas to be provided for turning traffic.
2. Where space permits, staggered junctions are preferable to crossroads on safety grounds.
3. Roundabout and median barrier
4. Restriction on turning movements
5. Adequate signs and signals
6. Shoulder sealing
7. Signage before the approaching curve
8. Pedestrian crossings
9. Removal of trees which are too close to the road
10. Speed restriction
11. Lane marking and proper signage
12. Reconstruction of deteriorated roads such that drainage is improved and life of roads is increased

IX. CONCLUSION

The study shows that the main causes, effects and locations of accidents on National Highways are:

1. Occurring on straight stretches due to high speed.
2. Occurring at four arm junctions due to insufficient sight distance, lack of traffic guidance, and absence of markings and poor road geometries.
3. Head-on collisions due to high speed and bad overtaking practice.
4. Pedestrians are most vulnerable due to insufficient pedestrian facilities, poor knowledge of traffic rules and making errors.
5. The main recorded cause of accidents is driver error
6. Negligence and over speeding is as high as 90%.
7. Maximum casualties are in cars, followed by pedestrians and trucks.

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